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SHOWA HIGH POLYMER CO LTD		
92.04.10 92JP-091118 (93.10.13) C08G 18/42, 18/73, 18/75		
Satd. aliphatic polyester contg. a small number of urethane bonds - has excellent heat stability, strength and mouldability, and is biodegradable (Eng)		
C93-143358	R(DE FR GB IT)	
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A satd. aliphatic polyester contg. urethane bonds, Mn at least 10000-at least 30000, Mw/Mn at least 2.5, viscosity at least 10 poise (10% in o-chlorophenol, 25°C), and m.pt. at least 60°C has formula (I):

R¹, R² = straight chain alkylene-(CH₂CH₂)_p- and -(CH₂CH₂)_q-

p, q = integer 1-5;

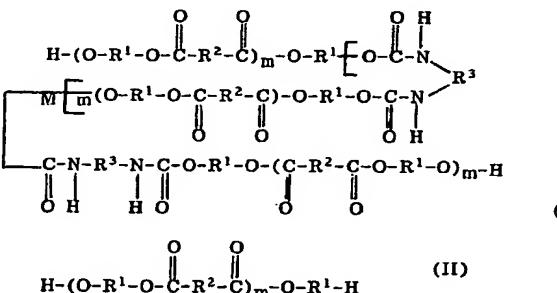
R³ = diisocyanate residue;

m = as below; and

M = 0 or at least 1.

The polyester is obt. by reaction of a polyesterdiol with Mn at least 5000, Mw at least 15000, Mw/Mn at least 2.5, of formula (II) and a diisocyanate

A(5-G2, 9-A, 10-E24)



m = number ave. degree of polymsn.

MORE SPECIFICALLY

p, q = 1 or 2;

R¹, R² = different alkylene gps., esp.

R¹ = tetramethylene gp.; and

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R² = ethylene gp.; and
R³ = alkylene or alicyclic gp., esp. hexamethylene.

USE/ADVANTAGE

The polyester exhibits excellent heat stability, strength and mouldability, and is biodegradable. It can be formed easily, without gelation problems, by adding diisocyanate to molten polyesterdiol.

PREFERRED POLYESTER

The polyesterdiol is obt. by reaction of ethylene glycol or 1,4-butanediol with succinic acid (anhydride), and has Mn at least 10000, Mw at least 30000, and Mw/Mn = 3.8. The polyester has Mn at least 20000 (20000-70000), Mw at least 100000 (100000-1000000), Mw/Mn at least 3 (3-8), m.pt. at least 90°C, and viscosity at least 100 poise (10% in o-chlorophenol, 25°C).

EXAMPLE

A mixt. of (g) 1,4-butanediol (300), succinic acid (348) and dibutoxyacetoxo Ti (0.13) was esterified at 200-205°C under N₂ to acid value 7.9. Glycol elimination was then performed at 210-215°C with the pressure finally reduced to 0.5 Torr to obtain a polyesterdiol with Mn 16600, Mw 41500, Mw/Mn 3.5, and m.pt. 115°C, being a white waxy polymer at room temp. due to crystallinity.

The polyesterdiol (540) was heated to 210°C and hexamethylene diisocyanate (7) added, the viscosity increasing rapidly without gelation. The polyester produced had small amts. of urethane bonds, Mn 32000, Mw 98000, Mw/Mn 3.1, corresponding to (I, M = 0). Viscosity was 233 poise (10% in o-chlorophenol, 25°C), m.pt. was 120°C and MFR 1.9 (JIS K 7210; 190°C; 2.16 kg). After melting at 190°C, the polyester was extruded and stretched at 4 x 2.5 times at 80°C into a transparent film, thickness 35-40μ. The film was extremely tough and had lengthwise tensile strength 14.9 kg/cm². (22pp2235JSDwgNo0/8).

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